

**TC7000 INSTALLATION DIAGNOSTICS (IMT000)**

**USER'S GUIDE**



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## TABLE OF CONTENTS

Section	Page
<b>ONE GENERAL DESCRIPTION</b>	
1.1 INTRODUCTION .....	1-1
1.2 PRODUCT OVERVIEW .....	1-1
1.3 DISTRIBUTION MEDIA .....	1-1
1.4 COMPATIBILITY .....	1-2
1.4.1 HARDWARE .....	1-2
1.4.2 SOFTWARE .....	1-2
1.5 RELATED DOCUMENTATION .....	1-2
<b>TWO OPERATION</b>	
2.1 OVERVIEW .....	2-1
2.2 LOAD AND START PROCEDURES .....	2-1
2.2.1 LOAD PROCEDURE .....	2-1
2.2.2 SAMPLE CONFIGURE STATEMENT FOR VAX-11/750 .....	2-1
2.2.3 SAMPLE CONFIGURE STATEMENT FOR VAX-11/780 .....	2-2
2.2.4 START PROCEDURE .....	2-2
2.3 TESTS .....	2-2
2.4 SAMPLE DIALOG .....	2-8

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## Section 1 GENERAL DESCRIPTION

### 1.1 INTRODUCTION

This manual is designed to serve as a guide for those using the Emulex TC7000 Tape Controller Diagnostic Utility, IMT000, on Digital Equipment Corporation (DEC) VAX-11 computers. IMT000 is designed for use with the Emulex VAX Diagnostic Monitor, EVM.

This utility is designed for use by qualified installers of Emulex equipment, and thus it assumes that the user has some knowledge of hardware configurations, VAX architecture and terminology, and interpretation of error messages and device register contents.

This document contains two main sections, the contents of which are described briefly below.

Section 1            General description: This section contains an overview of IMT000, including its functions, hardware and software compatibility, distribution media, and related documentation.

Section 2            Operation: Describes operation of IMT000, including load and start procedures, diagnostic tests, and sample user dialog.

### 1.2 PRODUCT OVERVIEW

IMT000 is an installation diagnostic for the TC7000 tape controller. The TC7000 emulates the DEC TM03/TU77 MASSBUS tape subsystem, including the DEC RH750 and RH780 MBAs and the logic in up to eight tape transports connected to the MASSBUS. See the TC7000 technical manual referenced in subsection 1.5 for further information.

### 1.3 DISTRIBUTION MEDIA

The following table lists and describes distribution media for IMT000 and other Emulex VAX diagnostic software.

Emulex P/N	Description
VX9960407	TU58 cassette for VAX-11/750
VX9960507	Eight-inch floppy diskette for VAX-11/780
VX9960910	9-track mag tape for VAX-8600

## 1.4 COMPATIBILITY

### 1.4.1 HARDWARE

IMT000 is compatible with DEC VAX-11/750 and 11/780 computers. It is not compatible with the VAX-11/730, because the Emulex TC7000 tape coupler, which IMT000 tests, requires a MASSBUS adapter.

### 1.4.2 SOFTWARE

IMT000 is designed to run under the Emulex VAX Monitor, EVM. For information on EVM, see the EVM user's guide referenced in subsection 1.5.

## 1.5 RELATED DOCUMENTATION

The documents referenced in this subsection can be ordered from the following address:

Emulex Corporation  
3545 Harbor Blvd.  
Costa Mesa, CA 92626  
(714) 662-5600 TWX 910-595-2521

Title: Emulex VAX Monitor (EVM) User's Guide  
Publication Number: VX9950901

Title: TC7000 (MBA and TM03/TU77 Compatible) Tape  
Coupler Technical Manual  
Publication Number: TC7551001

Title: VAX Configuration Utility (IVV000) User's Guide  
Publication Number: VX9950905

## 2.1 OVERVIEW

This section describes IMT000 load and start procedures, and presents sample configure statements and sample output.

User input appears in **bold type**, to distinguish it from program output. The symbol **<return>** indicates the carriage return key.

## 2.2 LOAD AND START PROCEDURES

The procedure used to invoke EVM varies from one VAX system to another. For a description of EVM bootstrapping procedures, see the EVM user's guide, referenced in subsection 1.5.

### 2.2.1 LOAD PROCEDURE

After the EVM> prompt has appeared on the screen, type the following. (The default filename extension is .EXE.)

```
EVM>LOAD IMT000<return>
```

For the VAX-11/750 and 11/780, the LOAD statement may be followed by an optional SET CONFIGURATION statement. Sample configure statements are presented in the following subsections. For additional information regarding the SET CONFIGURATION statement, see the EVM user's guide.

### 2.2.2 SAMPLE CONFIGURE STATEMENT FOR VAX-11/750

The following statement refers to a VAX-11/750 with a TC7000 tape coupler at MASSBUS address RH1 (base address F2A000), with one Kennedy 9400 at drive 1:

```
EVM>LOAD IMT000<return>  
EVM>SET CONFIG/ADAPTER:1/DRIVE:1<return>
```

Acceptable values for ADAPTER are 0, 1, or 2, with 2 the default:

ADAPTER 0	RH0, F28000
ADAPTER 1	RH1, F2A000
ADAPTER 2	RH2, F2C000

The default value for /DRIVE is 0.

### 2.2.3 SAMPLE CONFIGURE STATEMENT FOR VAX-11/780

The following statement refers to a VAX-11/780 with a TC7000 tape coupler at MASSBUS address RH1 (TR 9) and one Kennedy 9400 tape transport at drive 1:

```
EVM>LOAD IMT000<return>
EVM>SET CONFIG/TR:9/DRIVE:1/BR:4<return>
```

In the preceding statement, valid values for TR are 1 through 15, but the range 8 through 11 is the convention:

```
TR 8      RH0, 20010000
TR 9      RH1, 20012000
TR 10     RH2, 20014000
TR 11     RH3, 20016000
```

BR needs to be specified only if the VMASTER is set for other than BR 5, the default value. Valid values for BR are 4 through 7.

### 2.2.4 START PROCEDURE

After typing the LOAD and SET CONFIGURATION statements, type:

```
EVM>START/TEST:n/PASSES:x<return>
```

where *n* is a decimal test number in the range 1 through 34, or a range of test numbers separated by a colon, and *x* is the desired number of passes in the range 0 through 100.

The qualifier /TEST is optional; if it is omitted, all tests are run.

/PASSES is also optional, and needs to be specified only if multiple passes are desired. The default value is 1, and 0 signifies an infinite number of passes.

## 2.3 TESTS

This subsection describes the 34 diagnostic tests available with IMT000. For descriptions of bits and registers named in this subsection, see the TC7000 technical manual referenced in subsection 1.5 of this document.

On the first pass for each drive, each diagnostic test is performed only once. If more than one pass has been requested (see subsection 2.2), then on subsequent passes each test is performed the specified number of times. It is also possible to loop on a diagnostic test, by setting the LOOP flag with the EVM SET FLAGS command; see the EVM user's guide for details.



## Tests

### NOTE

The HELP facility documented in the EVM user's guide is not yet available with the IMT000 diagnostic.

#### Test 1 MBA and Drive Register Validation Test

This test reads the MBA internal registers, 256 MBA map registers, and drive registers in order to verify that these registers exist. It ignores the register contents. The test fails if a bus timeout occurs for any register transfer.

#### Test 2 MBA Registers Init Test

This test verifies that the MBA registers can be cleared by MBA initialization. It loads known data into MBACR and MBADR, reads the data back, and verifies that it is correct. It then clears these registers by MBA init and verifies that they are cleared.

#### Test 3 Drive Registers Init Test

This test verifies that the drive registers can be cleared by MBA initialization. It loads known data into CS1 and DA, reads the data back, and verifies that it is correct. It then clears these registers by MBA init and verifies that they are cleared.

#### Test 4 Test Bits in MBA Control Register

This test verifies the loading and reading of all possible read/write bits in MBACR with both a floating zeros and a floating ones pattern.

#### Test 5 Test Bits in MBA Virtual Address Register

This test verifies the loading and reading of all possible read/write bits in the MBA virtual address register with both a floating zeros and a floating ones pattern.

#### Test 6 Test Bits in MBA Byte Count Register

This test verifies the loading and reading of all possible read/write bits in MBABR with both a floating zeros and a floating ones pattern.

### Test 7 Test Bits in MBA Map Registers

This test verifies that all map registers can be read and written to. It writes a unique pattern in each map register, reads the pattern back, and verifies that it is correct.

### Test 8 Illegal Register ILR Test

This test reads all valid drive registers (00g through 44g) and verifies that no error bits are set. It reads all invalid drive registers (100g through 144g) and checks for ILR set in ER.

### Test 9 MBASR Upper 16 Bits Test

This test sets SIMATTN in MBADR, and verifies that the ATTN bit in MBASR is set. It reads all drive registers and verifies that the upper 16 bits of MBASR read out as the upper 16 bits of any drive register.

### Test 10 Test Attention Interrupt With/Without IE Set

This test consists of two subtests:

- It verifies that asserting ATTN in MBASR causes an interrupt to the CPU if IE is set.
- It verifies that asserting ATTN in MBASR does not cause an interrupt to the CPU if IE is not set.

### Test 11 Qualification Test

This test occurs immediately after the DRIVE selection. It verifies that the MASSBUS is alive, and that the drive under test exists and is available. It has six subtests, which check the status of the following bits: NED, TAP, DVA, MOL, DPR, AND DRY.

### Test 12 Drive Control Status Register 1

The purpose of this test is to verify that the drive control status bits can be written into and read from, and that they are neither stuck at 0 nor stuck at 1. It verifies the loading and reading of all possible read/write bits in drive control status register 1 (except for the GO bit) with both a floating zeros and a floating ones pattern

## Tests

### Test 13 TMER Register

This test verifies that the error register bits can be written into and read from, and that they are neither stuck at 0 nor stuck at 1.

### Test 14 Tape Control (TC) Register

This test verifies that tape control bits <0:11> can be written into and read from, using both a floating zeros and a floating ones pattern. It also verifies that these bits are neither stuck at 0 nor stuck at 1, by trying to clear the register and by writing all ones to it.

### Test 15 TMFC Register

This test verifies that the frame count bits can be written into and read from, using both a floating zeros and a floating ones pattern. It also checks the frame count register to verify that these bits are neither stuck at 0 nor stuck at 1.

### Tests 16 through 19 Test Bits in MR Register

These four tests verify that the various bits of the MR register can be written into and read, that they are not stuck at 1 nor stuck at 0, and that they otherwise behave as expected.

### Test 20 CS1 GO Bit Set/Reset Test

This test verifies that the GO bit can be set in a simulated read operation, and that it can be cleared with an Init.

### Test 21 DS Register Test DRY Bit

This test checks the DRY (Drive Ready) bit in the drive status (DS) register. It first verifies that DRY is set, then does a Read (which should reset DRY) and a drive Init to see if the drive is ready.

### Test 22 Rewind Test

This test checks the Rewind function. It writes 10 records, issues a Rewind, and checks the status of the PIP (Positioning in Process) and DRY bits in the drive status register. It fails with an error message if the drive is offline.

### Test 23 Interrupt Test

This test verifies that an interrupt is received when expected. It fails with an error message if the drive is offline.

### Test 24 Illegal Function Codes Test

This test consists of subtests executed by loading the CS register with illegal function codes from a table. It checks the ER register for bit ILF = 1.

### Test 25 Register Modification Refused (RMR)

This test verifies that RMR is set when a Write is attempted to any drive register (except TMS and TMRR) with DRY = 0 and GO = 1.

### Test 26 Format Error (FMT)

This test checks for format error by loading TMTC with an illegal format code and then with a legal format code, and verifying that FMT is reset. The test is repeated for other illegal format codes.

### Test 27 Non-Executable Function (NEF)

This test checks the NEF bit in the ER register. It sets up one offline and two online error conditions, and checks to see if the NEF bit is set.

### Test 28 Frame Count Status (FCS)

This test initializes the drive, checks the FCS bit, and then initializes the drive again. It writes to the frame counter and then checks FCS again.

### Test 29 Frame Count Error

This test includes two subtests:

- It sets the MBA byte count greater than the tape frame count, does a Write Forward, and then checks to determine if FCE is set. An error results if FCE is not set.
- It sets the MBA byte count less than the tape frame count, does a Write Forward, and then verifies that FCE is not set. An error results if FCE is set.

## Tests

### Test 30 Tape Exercises: Qualification Tests With Medium Online

This test exercises all available tape functions and checks for possible errors. The programmed sequence is as follows:\

1. Drive Init
2. Rewind
3. Issue a NOP command
4. Write Forward
5. Read Reverse or Backspace (if Read Reverse not supported)
6. Write Check Forward
7. Write Check Reverse
8. Read Forward
9. Backspace
10. Space Forward
11. Write Tape Mark
12. Backspace and check for tape mark
13. Erase tape (to erase tape mark)
14. Backspace and verify that there is no tape mark

### Test 31 Write Tape Mark Verification Test

This test writes one record of 1024 bytes, followed by a tape mark, and then does a Space Reverse. It then does a Space Forward of three records, and verifies that TM is set and Frame Count = 177777.

### Test 32 Read-In-Preset Status Change Test

This test verifies that the Read-In-Preset command sets the tape control correctly and causes the slave to rewind.

### Test 33 EOT Verification Test

This test writes several 1024-byte records until EOT = 1. It then does a Backspace of two records and verifies that EOT = 0; reads forward two records and verifies that EOT = 1; and reads backward three records and verifies that EOT = 0.

## Test 34 Rewind Offline Test

This test checks the Rewind Offline function. It writes two records, each containing 1K bytes, and issues a Write Offline command to rewind back to BOT. The program verifies that the drive is offline.

### NOTE

After running this test, the operator must intervene to set the drive online again. IMT000 displays a reminder to this effect, as shown in the sample output in subsection 2.4 of this document.

## 2.4 SAMPLE DIALOG

After you start IMT000 execution, the program announces itself and then asks questions regarding your tape transport. See the manufacturer's technical manual for the appropriate responses.

In this example, the operator has selected PE mode (the default, option 1) and has indicated that the drive supports read reverse (the default, Y).

### NOTE

The CDC 92185 (Keystone 2) does not support the read reverse function in GCR density mode.

After you have entered these parameters, the program runs the diagnostic tests sequentially. In this example, the operator did not specify any test numbers, so all the tests are run. As each test runs, its title appears on the screen.

Note that, in some instances, program output has been continued to a second line of text here because of space limitations.

EVM>START<return>

Emulex TC7000 Tape Controller Diagnostics REV v1.0 DD-MMM-YYYY  
TIME

Density desired (PE=1, NRZI=2, GCR=3) [HEX - 1,3,(1)]>>>  
<return>

If the drive in use supports READ REVERSE function: [Y,N,(Y)]>>>  
<return>

Slave selected, density = 1600 BPI (PE):4CO(X)

## Sample Dialog

```
TEST # 1 MBA and DRIVE register validation tests dd-mmm-yyyy
Time
TEST # 2 MBA Registers' INIT test dd-mmm-yyyy Time
TEST # 3 DRIVE Registers' INIT test dd-mmm-yyyy Time
TEST # 4 Test bits in MBA control Register dd-mmm-yyyy Time
TEST # 5 Test bits in MBA virtual address register dd-mmm-yyyy
Time
TEST # 6 Test bits in MBA byte count register dd-mmm-yyyy Time
TEST # 7 Test bits in MBA map register dd-mmm-yyyy Time
TEST # 8 Illegal register _ ILR test dd-mmm-yyyy Time
TEST # 9 MBASR upper 16 - bits test dd-mmm-yyyy Time
TEST #10 Test attention interrupt with/without 'IE' set dd-mmm-
yyyy- Time
TEST #11 Qualification tests dd-mmm-yyyy Time
TEST #12 CS1 Register dd-mmm-yyyy Time
TEST #13 ER - Register dd-mmm-yyyy Time
TEST #14 TC Register dd-mmm-yyyy Time
TEST #15 FC Register dd-mmm-yyyy Time
TEST #16 MR sets bit0 and clears other r/w bits dd-mmm-yyyy
Time
TEST #17 MR - Checks for stuck at zero bits by loading ones dd-
mmm-yyyy Time
TEST #18 MR - Writes floating ONE through the reg; bits 1-4 dd-
mmm-yyyy Time
TEST #19 MR - Writes floating ZERO through the reg; bits 1-4
dd-mmm- yyyy Time
TEST #20 CS1 - GO bit SET RESET test dd-mmm-yyyy Time
TEST #21 DS - Test DRY bit dd-mmm-yyyy Time
TEST #22 REWIND test dd-mmm-yyyy Time
TEST #23 INTERRUPT test dd-mmm-yyyy Time
TEST #24 Illegal Function Test dd-mmm-yyyy Time
TEST #25 Register Modification Refused (RMR) dd-mmm-yyyy Time
TEST #26 Format Error (FMT) dd-mmm-yyyy Time
TEST #27 Non-Executable Function (NEF) dd-mmm-yyyy Time
TEST #28 Frame Count Status test (FCS) dd-mmm-yyyy Time
TEST #29 Frame Count Error test (FCE) dd-mmm-yyyy Time
TEST #30 Tape Exercises - Medium Online Qualification tests dd-
mmm-yyyy Time
TEST #31 Write tape mark verification test dd-mmm-yyyy Time
TEST #32 READ-IN preset status change test dd-mmm-yyyy Time
TEST #33 EOT verification test dd-mmm-yyyy Time
TEST #34 REWIND offline test dd-mmm-yyyy Time
PLEASE SET THE DRIVE ON-LINE
```

### SUMMARY REPORT:

```
TOTAL # ERRORS = 0 (0 SYSTEM, 0 DEVICE, 0 HARD, 0 SOFT)
dd-mmm-yyyy Time
```

EVM>

**BLANK**